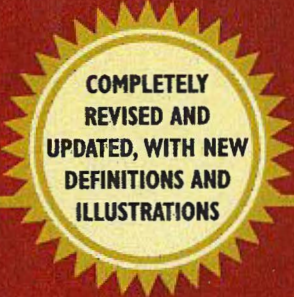


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absolute value The magnitude of a number, without respect to its sign (+ or -). An absolute value is always either positive or zero; for example, the absolute value of both 10 and -10 is 10. Programming languages and spreadsheet programs commonly include functions that return the absolute value of a number.

abstract In information processing and library science, a summary, often consisting of one paragraph or a few paragraphs, at the beginning of an investigative document such as a scientific paper.

In character recognition systems, an adjective describing a type of symbol that, unlike a letter or a numeral, has no intrinsic meaning and must be defined before it can be interpreted.

In programming, an adjective referring to a data type that is defined by the operations that can be performed on objects of that type rather than by the properties of the objects themselves. *See also* abstract data type.

abstract data type In programming, a data type that is defined in terms of the information it can contain and the operations that can be performed with it. An abstract data type is more generalized than one constrained by the properties of the objects it contains—for example, the data type “pet” is more generalized than the data types “pet dog,” “pet bird,” and “pet fish.” The standard example used in illustrating an abstract data type is the stack, a small portion of memory used to store information, generally on a temporary basis. As an abstract data type, the stack is simply a structure onto which values can be pushed (added) and from which they can be popped (removed). The type of value, such as *integer*, is irrelevant to the definition.

The way in which the program performs operations on abstract data types is encapsulated, or hidden, from the rest of the program. Encapsulation enables the programmer to change the definition of the data type or its operations without introducing errors to the existing code that uses the abstract data type. Abstract data types represent an intermediate step between traditional programming and object-oriented programming. *See also* module, object-oriented programming.

AC *See* alternating current.

accelerator In applications, a key or combination of keys that a user presses to perform an application-defined function. Also called a shortcut key, an accelerator offers a convenient alternative to the mouse in a graphical application.

In hardware, a device that quickens or otherwise improves the operation of one or more subsystems, resulting in better overall system performance. Accelerators are commonly used in computers’ display adapters and microprocessors. Depending on the application, an accelerator might not need special software in the form of a device driver to control it. *See also* accelerator card, Windows-based accelerator.

accelerator card A printed circuit board that replaces or augments the computer’s main microprocessor with a faster one. An accelerator card allows a user to upgrade a system to a faster microprocessor without having to replace the cards, drives, keyboard, or case.

acceptance test A formal evaluation performed by a customer, usually at the factory, to verify that the manufacturer has met the agreed-upon specifications and that a device is functioning as intended.

access To obtain entry to, or to locate, read into memory, and make ready for, some operation. *Access* is used with regard to disks, files, records, and network entry procedures.

access arm The arm that carries the read/write head(s) over the surface of the disk in a disk drive. *See* the illustration.

access code A unique combination of characters, usually letters or numbers, used in communications as identification for gaining access to a remote computer. On a network or an online service, the access code is generally referred to as user name or user ID and password.

access mechanism The disk-drive components that position the read/write head(s) over the tracks of a magnetic or an optical disk. More generally, *access mechanism* is used to mean any circuit board or integrated circuit that permits one part of a computer system to send signals to another part. For example, a central processing unit



subtraction, multiplication, or division. The term is also used in reference to negative numbers and absolute values.

arithmetic operator An operator that performs an arithmetic (numeric) operation: +, -, x, or /. An arithmetic operator usually takes one or two numeric arguments. *See also* argument, binary, logical operator, operator, unary.

ARPANET A network of about 60,000 medium-to-large-scale computers established in the 1960s and developed by the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense as a vehicle for enabling universities and research organizations to exchange information freely. ARPANET, although part of the Department of Defense, is not a classified government or military network.

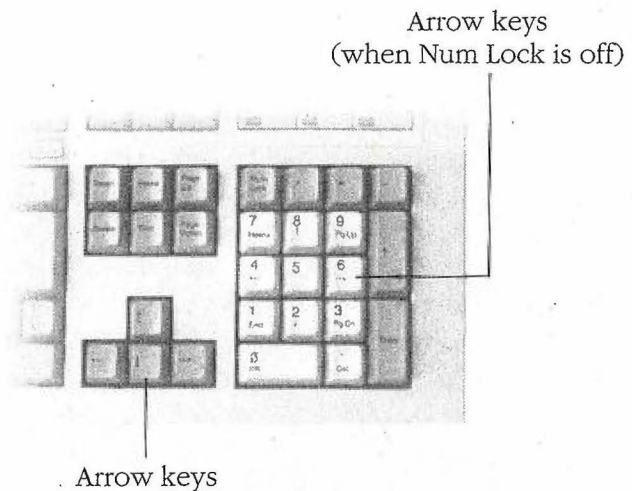
array In programming, a list of data values, all of the same type. Any element in the array can be referenced by an expression composed of the name of the array followed by an indexing expression. Most languages that implement arrays accept (or require) an integer expression for the index; some languages, such as Pascal, also allow other data types (such as enumerated data types) to be used as array indices. *See also* array element, index, record, vector.

array element A data value in an array. Each array element can (usually) be treated as a stand-alone variable. A specific element can be referenced by combining the array name with an indexing expression. *See also* array, index.

array processor A group of identical processors connected together and operating synchronously, often under the control of a central processor. Some computers use array processors for high-speed floating-point math operations or to speed up video operations. *See also* parallel processing.

arrow key Any of a set of four cursor-movement keys labeled with arrows pointing up, down, left, or right, used to move the cursor horizontally or vertically on the screen or, in some programs, to extend the highlight. See the illustration.

artificial intelligence Abbreviated AI. The branch of computer science that deals with enabling



Arrow key.

When NumLock is off, the arrow keys on the number keypad can be used.

computers to emulate such aspects of intelligence as speech recognition, deduction, inference, creative response, the ability to learn from past experience, and the ability to make reasonable inferences from incomplete information. AI is a complex arena that includes work in two related areas—one involved with understanding how living things think and the other with finding ways to impart similar capabilities to computer programs. Some tasks that used to be considered very difficult for a computer to perform, such as playing chess, have turned out to be relatively easy to program; and some tasks that were once thought easy to program, such as speech recognition and language translation, have turned out to be extremely difficult. Practical applications in this area include computer-based chess games and diagnostic aids, called expert systems, that are used by physicians and other professionals. *See also* expert system, fuzzy logic, LISP, Logo, neural network, Prolog, Turing test.

ascender That portion of a lowercase letter that rises above the main body (x-height) of the letter (see the illustration). *Compare* descender; *see also* baseline, x-height.

ascending order The arrangement of items on a list from lowest to highest, for example, from 1 to 10 or from A to Z. The rules for determining



British numbering system differs from the American in considering 1 billion equal to 1 million million, or 10^{12} ; in American numbers, this is 1 trillion.)

billisecond Synonym for *nanosecond* (the more common term); one billionth of a second.

binary From bi-, meaning two; generally, a term describing a system, statement, or condition that has two components, alternatives, or outcomes. In mathematics, binary is the base-2 number system, in which values are expressed as combinations of two digits, 0 and 1. Because these digits can be used to represent two states, on and off or true and false, which in turn can be easily represented by two voltage levels in an electronic device, the binary number system is at the heart of digital computing. By way of contrast, a similar situation using the more familiar decimal system would require electronic devices capable of representing digits by any of ten voltage levels, resulting in slower, more error-prone computers. The first ten binary numbers and their decimal equivalents are shown below:

Binary	Decimal
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9

Binary numbers are typically written as four-digit combinations. To avoid possible confusion with decimal numbers, they are also usually followed by the letter *b*. Thus, decimal 2 is written *0010b* or *10b* in binary so that it will not be confused with decimal 10. Binary numbers "grow" in the same way as decimal numbers, although far more quickly because they are based on powers of 2, rather than (decimal) 10. For example:

$$\begin{aligned} 2^1 \text{ (decimal 2)} &= 10_{(2)} \\ 2^2 \text{ (decimal 4)} &= 100_{(2)} \\ 2^3 \text{ (decimal 8)} &= 1000_{(2)} \end{aligned}$$

In contrast:

$$\begin{aligned} 10^1 &= 10_{(10)} \\ 10^2 &= 100_{(10)} \\ 10^3 &= 1000_{(10)} \end{aligned}$$

Although ideal for computers, binary numbers are usually difficult for people to interpret because they are repetitive strings of 1's and 0's. To ease translation, programmers and others who habitually work with the computer's internal processing abilities use hexadecimal (base-16) or octal (base-8) numbers. Equivalents and conversion tables for binary, decimal, octal, and hexadecimal are in Appendix E. *Compare* decimal, hexadecimal, octal; *see also* base, binary number, binary-coded decimal, Boolean algebra, cyclic binary code, dyadic, logic circuit.

binary chop *See* binary search.

binary-coded decimal Abbreviated BCD. A system for encoding decimal numbers in binary form to avoid rounding and conversion errors. In BCD coding, each digit of a decimal number is coded separately as a binary numeral. Each of the decimal digits 0 through 9 is coded in 4 bits, and for ease of reading, each group of 4 bits is separated by a space. This format, called 8-4-2-1 after the weights of the four bit positions, uses the following codes:

0000 = 0	0101 = 5
0001 = 1	0110 = 6
0010 = 2	0111 = 7
0011 = 3	1000 = 8
0100 = 4	1001 = 9

Thus, the decimal number 12 is *0001 0010* in BCD notation, 96 is *1001 0110*, and so on. *See also* binary, decimal, EBCDIC, packed decimal, round.

binary conversion The conversion of a number to or from the binary number system. Conversion tables are in Appendix E. *See also* binary.

binary device Any device that processes infor-



a symbol (such as the name of a variable) with some descriptive information (such as a memory address, a data type, or an actual value). *See also* binding time, dynamic-binding, static binding.

binding time The point in a program's use at which binding of information occurs, usually in reference to program elements being bound to their storage locations and values. The most common binding times are during compilation (compile-time binding), during linking (link-time binding), and during program execution (run-time binding). Binding of different types of elements often occurs at different times. *See also* bind, compile time, link time, run time.

binomial distribution Also called Bernoulli distribution. In statistics, a list or a function that describes the probabilities of the possible values of a random variable chosen by means of a Bernoulli sampling process. A Bernoulli process has three characteristics: Each trial has only two possible outcomes—success or failure; each trial is independent of all other trials; and the probability of success for each trial is constant. A binomial distribution can be used to calculate the probability of getting a specified number of successes in a Bernoulli process. For example, the binomial distribution can be used to calculate the probability of getting a seven three times when a pair of dice is rolled twenty times.

bionics The study of living organisms—their characteristics and the ways they function—with a view toward creating hardware that can simulate or duplicate the activities of a biological system. *See also* cybernetics.

BIOS Pronounced “bye-ose”; acronym for basic input/output system, a set of routines that work closely with the hardware to support the transfer of information between elements of the system, such as memory, disks, and the monitor. On IBM and compatible computers, the BIOS, or ROM BIOS, is built into the machine's read-only memory (ROM). Although critical to performance, the BIOS is usually invisible to computer users. The BIOS can, however, be accessed by programmers. *See also* AMI BIOS, Phoenix BIOS.

bipolar Literally, having two opposite states, such

as positive and negative. In information transfer and processing, a bipolar signal is one in which opposite voltage polarities represent on and off, as in a communications signal, or true and false, as in a logic circuit. *Compare* unipolar; *see also* nonreturn to zero.

In electronics, bipolar refers to a type of transistor. *See also* transistor.

BIS *See* business information system.

bistable A term describing a system or device that has two possible states, such as ON and OFF. *See also* flip-flop.

bistable circuit Any circuit that has only two stable states. The transition between them must be initiated from outside the circuit. A bistable circuit is capable of storing one bit of information.

bistable multivibrator *See* flip-flop.

BISYNC Pronounced “bye-sink.” Acronym for binary synchronous communications protocol, a communications standard developed by IBM. BISYNC transmissions are encoded in either ASCII or EBCDIC. Messages can be of any length and are sent in units called frames, optionally preceded by a message header. Because BISYNC uses synchronous transmission, in which message elements are separated by a specific time interval, each frame is preceded and followed by special characters that enable the sending and receiving machines to synchronize their clocks. The basic structure of a BISYNC frame is shown in the illustration. STX and ETX are control characters that mark the beginning and end of the message text; BCC is a set of characters used to verify the accuracy of transmission.

bit Short for binary digit; either 1 or 0 in the binary number system. In processing and storage, a bit is the smallest unit of information handled by a computer and is represented physically by an element such as a single pulse sent through a circuit or a small spot on a magnetic disk capable of storing either a 1 or a 0. Considered singly, bits convey little information a human would consider meaningful. In groups of eight, however, bits become the familiar bytes used to represent all types of information, including the letters of



the alphabet and the digits 0 through 9. *See also* ASCII, binary, byte.

bit block In computer graphics and display, a rectangular group of pixels treated as a unit. Bit blocks are so named because they are, literally, blocks of bits describing the pixels' display characteristics, such as color and intensity. Programmers use bit blocks and a technique called bit block transfer (bitblt) to rapidly display or animate images on the screen. *See also* bit block transfer.

bit block transfer Also called bitblt (pronounced "bit-blit"). In graphics display and animation, a programming technique that manipulates, in memory, rectangular blocks of bits representing the color and other attributes of the pixels forming a screen image. The image described can range from a cursor to a cartoon. Bit block transfers involve moving these bit blocks through a computer's video RAM as a unit so they can be rapidly displayed in a desired location on the screen. Bit block transfers can also involve altering the descriptions of the bits/pixels composing an image; for example, light and dark portions of an image can be reversed. Successive displays can thus be used to change the appearance of an image or to move it around on the screen. Some computers, such as the Commodore Amiga, contain special graphics hardware for manipulating bit blocks on the screen independently of the contents of the rest of the screen. This speeds the animation of small shapes because a program needn't constantly compare and redraw the background around the moving shape. *See also* sprite.

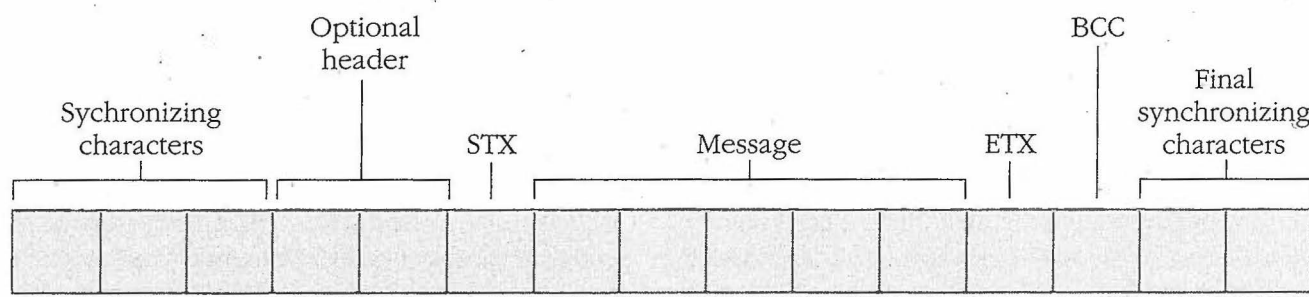
bitblt *See* bit block transfer.

bit bucket An imaginary location into which data can be discarded. A bit bucket is a null input/output device from which no data is read and to which data can be written without effect. The NUL device recognized by MS-DOS is a bit bucket. A directory listing, for example, simply disappears when sent to NUL.

bit density A measure of the amount of information per unit of linear distance or surface area in a storage medium or per unit of time in a communications pipeline.

bit flipping A process of inverting bits—changing 1's to 0's and vice versa. For example, in a graphics program, to invert a black-and-white bit-mapped image (to change black to white and vice versa), the program could simply flip the bits that compose the bit map.

bit image A sequential collection of bits that represents, in memory, an image to be displayed on the screen, particularly in systems having a graphical user interface. Each bit in a bit image corresponds to one pixel (dot) on the screen. The screen itself, for example, represents a single bit image; similarly, the dot patterns for all the characters in a font represent a bit image of the font. On a computer such as the Macintosh Classic, which has a black-and-white screen, the bit values in a bit image can be either 0, to display white, or 1, to display black. The "pattern" of 0's and 1's in the bit image then determines the pattern of white and black dots forming an image on the screen. On a Macintosh or other computer that supports color, the corresponding description



BISYNC. *The structure of a BISYNC frame.*



monitor, the electron beam rhythmically sweeps across and down the screen, "painting" an image as it moves. The beam moves in a precisely synchronized pattern from left to right and top to bottom. At the right edge of each line, the display signal is turned off while the beam returns to the left to begin a new line. The return is called the horizontal retrace, and the very brief pause during this repositioning is called the horizontal blanking interval. Similarly, at the bottom right corner of the display, the signal is turned off while the electron beam moves to the top left corner. This change in position is called the vertical retrace, and the associated pause is the vertical blanking interval. Blanking is necessary to avoid marking the screen (and corrupting the displayed image) with the retrace paths followed by the electron beam.

blast See burn.

bleed In a printed document, any element that runs off the edge of the page or into the gutter. Bleeds are often used in books, for example, to mark important pages so they are easier to find.

blind search A search for data in memory or on a storage device with no foreknowledge as to the data's order or location. *Compare* binary search, indexed search; *see also* linear search.

blinking The flashing on and off of a displayed character or image on a computer screen. Blinking is typical of cursors, insertion points, menu choices, warning messages, and other displays that are meant to catch the eye. Some blinking, such as the "blink rate" of the insertion point on the Macintosh, can be controlled by the user.

blip A small, optically sensed mark on a recording medium, such as microfilm, that is used for counting or other tracking purposes.

block Literally, a group of similar things—usually bytes of storage or data, or segments of text. The word *block* is used in many contexts, so its exact definition varies with the type of item referenced. In programming, a block is a section of random access memory temporarily assigned (allocated) to a program by the operating system or a group of statements in a program that are treated as a unit.

In communications, a block is a unit of transmitted information consisting of identification codes, data, and error-checking codes.

In disk storage, a block is a collection of consecutive bytes of data that are read from or written to the disk as a group.

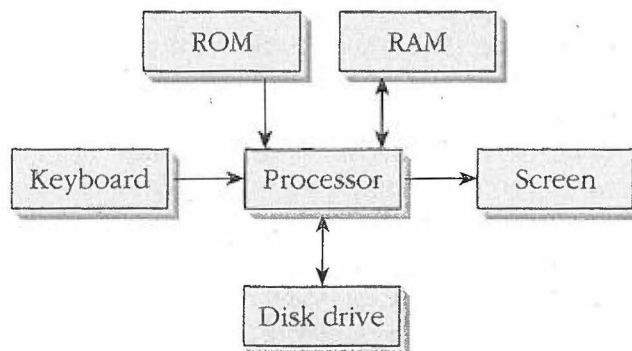
In video, a block is a rectangular grid of pixels that are handled as a unit.

In applications, a block is a segment of text that can be selected and acted upon as a whole.

block cursor An on-screen cursor that has the same width and height, in pixels, as a text-mode character cell. A block cursor is used in text-based applications, especially as the mouse pointer when a mouse is installed in the system. *See also* character cell, cursor, mouse pointer.

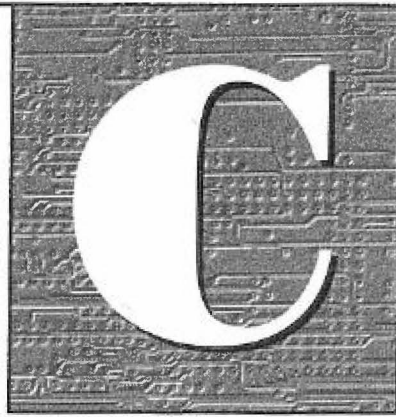
block device A device, such as a disk drive, that moves information in blocks—groups of bytes—rather than one character (byte) at a time. *Compare* character device.

block diagram A chart of a computer or other system in which labeled blocks are used to represent the components, and lines and arrows show the pathways and relationships among the elements. *See the illustration.* A block diagram is an overall schematic that shows what a system consists of and how it works. A flowchart shows the operational specifics of such a system in more detail. *Compare* flowchart.



Block diagram.

block gap Also called interblock gap, or IBG. In tape storage, a physical region, typically extending for a fraction of an inch, that separates blocks of data or physical records. In disk storage, the unused space between formatted sectors.



C A programming language developed by Dennis Ritchie at Bell Laboratories in 1972; so named because its immediate predecessor was the B programming language. Although C is considered by many to be more a machine-independent assembly language than a high-level language, its close association with the UNIX operating system, its enormous popularity, and its standardization by the American National Standards Institute (ANSI) have made it perhaps the closest thing to a standard programming language in the microcomputer/workstation marketplace. C is a compiled language that contains a small set of built-in functions that are machine dependent. The rest of the C functions are machine independent and are contained in libraries that can be accessed from C programs. C programs are composed of one or more functions defined by the programmer; thus C is a structured programming language. *See also* C++, compiled language, library, Objective-C, structured programming.

C++ An object-oriented version of the C programming language, developed by Bjarne Stroustrup in the early 1980s at Bell Laboratories and adopted by a number of vendors, including Apple Computer and Sun Microsystems. *See also* C, Objective-C, object-oriented programming.

cable A collection of wires shielded within a protective tube, used to connect peripheral devices to a computer. A mouse, a keyboard, and a printer might all be connected to a computer with cables. Printer cables typically implement a serial (bit-by-bit) or a parallel (byte-by-byte) path for data to travel along. Computer cables are of different sizes and connect the parts of a system

through a seeming myriad of round and oblong connectors. The pins and sockets in these connectors carry specific signals and are used to link specific types of hardware.

cable connector The connector on either end of a cable. *See also* DB connector, DIN connector, RS-232-C standard, RS-422/423/449.

cable matcher A device that allows the use of a cable that has slightly different wire connections from those required by the device(s) to which it is attached.

cabling diagram A plan that shows the path of cables that attach computer system components or peripherals. Cabling diagrams are particularly important for explaining the connection of disk drives to a disk controller.

cache A special memory subsystem in which frequently used data values are duplicated for quick access. A memory cache stores the contents of frequently accessed RAM locations and the addresses where these data items are stored. When the processor references an address in memory, the cache checks to see whether it holds that address. If it does hold the address, the data is returned to the processor; if it doesn't, a regular memory access occurs. A cache is useful when RAM accesses are slow compared with the microprocessor speed because cache memory is always faster than main RAM memory. *See also* disk cache, wait state.

cache memory *See* cache.

CAD Rhymes with "lad." Acronym for computer-aided design, a term applied to programs (and workstations) used in designing engineering, architectural, and scientific models ranging from



assembler, allowing the programmer to view an executable program in terms of human-readable assembly language. *Compare* assembler; *see also* decompiler.

disaster dump A dump (transfer of memory contents to a printer or another output device) made when a program fails without hope of recovery; an aid to finding the problem that caused the failure.

disc A round, flat piece of nonmagnetic, shiny metal encased in a plastic coating, designed to be read from and written to by optical (laser) technology. *See also* compact disc.

It is now standard practice to use the spelling *disc* for optical discs and the spelling *disk* in all other computer contexts, such as floppy disk, hard disk, RAM disk, and so on.

discrete Separate; individual; identifiable as a unit. For example, bits are discrete elements of data processed by a computer.

discretionary hyphen *See* hyphen.

disk A round, flat piece of flexible plastic (floppy disk) or inflexible metal (hard disk) coated with a magnetic material that can be electrically influenced to hold information recorded in digital (binary) form. A disk is, in most computers, the primary means of storing data on a permanent or semipermanent basis. Because the magnetic coating of the disk must be protected from damage and contamination, a floppy (5.25-inch) disk or microfloppy (3.5-inch) disk is encased in a protective plastic jacket. A hard disk, which is very finely machined, is enclosed in a rigid case and can be exposed only in a dust-free environment. Types of disks used with microcomputers include floppy disks, microfloppies, hard disks, and removable cartridges that can be used with some hard disk drives and units such as the Bernoulli box.

disk access time *See* access time.

disk buffer A small amount of memory set aside for the purpose of storing data read from, or about to be written to, disk. Because disk devices are slow compared with the CPU, it is not efficient to access the disk for only one or two bytes of data. Instead, during a read, a large chunk of

data is read and stored in the disk buffer. When the program wants information, it is copied from the buffer. Many requests for data can be satisfied by a single disk access. The same technique can be applied to disk writes. When the program has information to store, it writes it into the disk buffer area in memory. When the buffer has been filled, the entire contents of the buffer are written to disk in a single operation.

disk cache A portion of a computer's random access memory set aside for temporarily holding information read from disk. A disk cache does not hold entire files, as does a RAM disk (a portion of memory that acts as if it were a disk drive). Instead, a disk cache is used to hold information that either has recently been requested from disk or has previously been written to disk. For example, a program might need to read in repeatedly from disk either a portion of itself or the same portions of a data file. If the required information remains in a disk cache, access time is considerably faster than if the program must wait for the disk-drive mechanism to fetch the information from disk. *Compare* disk buffer; *see also* cache.

disk cartridge A removable disk enclosed in a protective case. A disk cartridge can be used by certain types of hard disk drives and related devices, such as the external data storage units known as Bernoulli boxes.

disk controller A special-purpose chip and associated circuitry that directs and controls reading from and writing to a computer's disk drive. Transferring information to and from a disk drive is a complex operation, and a disk controller handles such tasks as positioning the read/write head, mediating between the drive and the microprocessor, and controlling the transfer of information to and from memory. Disk controllers are used with both floppy disk drives and hard disks. In some computers, the disk controller is built into the system; for example, the floppy disk controller in Macintosh computers is a special chip known as the Integrated Woz Machine (IWM), named in honor of Steven Wozniak, its primary developer. In other machines, such as



and blinking. They are used, for example, in text-based systems to create reverse video effects (white on black vs. black on white) and for "boldfacing" a word by displaying it in high-intensity characters. Users of applications can control display attributes when programs allow them to change color and other screen elements.

display background In computer graphics, the portion of an on-screen image that remains static while other elements change—for example, window borders on a screen, or a palette of shapes or patterns in a drawing program.

display board *See* video adapter.

display card *See* video adapter.

display cycle The complete set of events that must occur in order for a computer image to be displayed on the screen, including both the software creation of an image in a computer's video memory and the hardware operations required for accurate on-screen display. *See also* refresh cycle.

display device *See* display.

display element *See* graphics primitive.

display entity *See* entity, graphics primitive.

display face A typeface suitable for headings and titles in documents, distinguished by its ability to stand out from other text on the page. Sans serif faces such as Helvetica and Avant Garde often work well as display faces. *Compare* body face; *see also* sans serif.

display frame One image in an animation sequence. *See also* frame.

display image The collection of elements displayed together at a single time on a computer screen.

display page One screenful of display information stored in a computer's video memory. Computers can have enough video memory to hold more than one display page at a time. In such instances programmers, especially those concerned with creating animation sequences, can update the screen rapidly by creating or modifying one display page while another is being viewed by the user. *See also* animation.

Display PostScript An extended version of the PostScript language, intended for device-

independent imaging (including monitors and printers) in a multitasking environment. Display PostScript has been adopted by some hardware manufacturers as the standard imaging approach for both screens and printers. *See also* PostScript.

display screen The part of a video unit on which images are shown. *See also* CRT.

display terminal *See* terminal.

distortion An undesirable change in the waveform of a signal. Distortion can occur during signal transmission, as when a radio broadcast becomes garbled. It can also occur when a signal passes through a circuit, as when a stereo is turned up too loud. Distortion often results in loss of information. It is mainly a problem in analog signals; digital signals are not affected by moderate distortion.

distribute To share out among locations or facilities, as in a data-processing function that is performed by a collection of computers and other devices linked together by a communications facility such as a network.

distributed database A database implemented on a network, in which the component partitions are distributed over various nodes (stations) of the network. Depending on the specific update and retrieval traffic, distributing the database can significantly enhance overall performance. *See also* partition.

distributed database management system Abbreviated DDBMS. A database management system capable of managing a distributed database. *See also* distributed database.

distributed intelligence A system in which processing ability (intelligence) is distributed among multiple computers and other devices, each of which can work independently to some degree but can also communicate with the other devices to function as part of the larger system. *See also* distributed processing.

distributed network A network in which processing, storage, and other functions are handled by separate units (nodes) rather than by a single main computer.

distributed processing A form of information processing in which work is performed by sepa-



declared within a procedure), or nested records (a record containing a field that is itself a record).

NetBIOS An application program interface (API) that can be used by application programs on a local area network consisting of IBM and compatible microcomputers running MS-DOS, OS/2, or some version of UNIX. Primarily of interest to programmers, NetBIOS provides application programs with a uniform set of commands for requesting the lower-level network services required to conduct sessions between nodes on a network and to transmit information back and forth. *See also* application program interface.

network A group of computers and associated devices that are connected by communications facilities. A network can involve permanent connections, such as cables, or temporary connections made through telephone or other communications links. A network can be as small as a local area network consisting of a few computers, printers, and other devices, or it can consist of many small and large computers distributed over a vast geographic area. Small or large, a computer network exists to provide computer users with the means of communicating and transferring information electronically. Some types of communication are simple user-to-user messages; others, of the type known as distributed processes, can involve several computers and the sharing of workloads or cooperative efforts in performing a task.

network adapter An expansion card or other device used to connect a computer to a local area network.

network administrator The person in charge of operations on either a wide area network or a local area network. The duties of a network administrator (also called a system administrator) can be broad and might include such tasks as installing new workstations and other devices, adding and removing authorized users, archiving files, overseeing password protection and other security measures, monitoring usage of shared resources, and handling malfunctioning equipment.

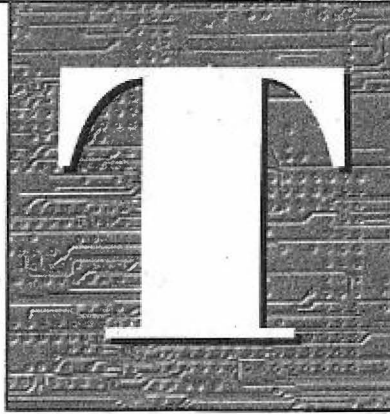
network architecture The underlying structure of a computer network, including hardware, functional layers, interfaces, and protocols (rules)

used to establish communication and ensure reliable transfer of information. Because a computer network is a mixture of hardware and software, network architectures are designed to provide both philosophical and physical standards for enabling computers and other devices to handle the complexities of establishing communications links and transferring information without conflict. Various network architectures exist, among them the internationally accepted seven-layer ISO Open Systems Interconnection (OSI) model and IBM's Systems Network Architecture (SNA). Both the OSI and SNA architectures organize network functions in layers, each layer dedicated to a particular aspect of communication or transmission and each requiring protocols that define how functions are carried out. The ultimate objective of these and other network architectures is the creation of communications standards that will enable computers of many kinds to exchange information freely and (to the user) transparently. *See also* ISO/OSI model, SNA.

network control program In a communications network that includes a mainframe computer, a program that usually resides in a communications controller and takes over communications tasks such as routing, error control, line control, and polling (checking terminals for transmissions), leaving the main computer free for other functions.

network database In information management, a type of database in which data records can be linked (related to one another) in more than one way. A network database is similar to a hierarchical database in the sense that it contains a progression from one record to another. It differs in being less rigidly structured: Any single record can point to more than one other record and, conversely, can be pointed to by one or more records. In effect, a network database allows more than one path between any two records, whereas a hierarchical database allows only one, from parent (higher-level record) to child (lower-level record). *Compare* hierarchical database, relational database.

network device driver Software that coordi-



T See *tera*.

tab character A character used to align lines and columns on the screen and on the printed page. A tab character is visually indistinguishable from a series of blank spaces entered by repeatedly pressing the Spacebar, but tab characters and space characters are different to a computer. A tab is a single character and therefore can be added, deleted, or overtyped with a single key-stroke. Some file-storage and transmission options allow the user to convert tab characters to equivalent numbers of Spacebar spaces, which can be useful when a file created with one program is to be read and used by another. The ASCII coding scheme includes two codes for tab characters: a horizontal tab for spacing across the screen or page and a vertical tab for spacing down the screen or page. The horizontal tab character is decimal 9 (hexadecimal 9); the vertical tab is decimal 11 (hexadecimal 0B).

Tab key A key, often labeled with both a left-pointing and a right-pointing arrow, that traditionally (as in word processing) is used to insert tab characters into a document. In other applications, however, the Tab key is often used to move the on-screen highlight from place to place. Menu-driven programs, for example, often use the Tab key to enable the user to move through the available choices. Similarly, many database and spreadsheet programs allow the user to press the Tab key to move around within a record or between cells, reserving the Enter (or Return) key for indicating that data entry is complete. In these capacities, the shifted version of the Tab key, "backtab," can be used to move

back one field or cell. See *also* tab character.

table In programming, a data structure usually consisting of a list of entries, each entry being identified by a unique key and containing a set of related values. A table is often implemented as an array of records, a linked list, or (in more primitive languages) several arrays of different data types, all using a common indexing scheme. See *also* array, list, record.

In relational databases, a data structure characterized by rows and columns, with data occupying or potentially occupying each cell formed by a row/column intersection. The table is the underlying structure of a relation.

table lookup The process of using a known value to search for data in a previously constructed table of values—for example, using a purchase price to search a tax table for the appropriate sales tax. See *also* lookup.

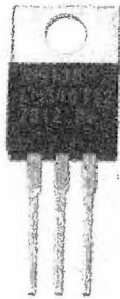
tablet See graphics tablet.

tabulate Usually, to total a row or column of numbers; less commonly, to arrange information in table form.

tag In programming, one or more characters containing information about a file, record type, or other structure. For example, a record with variants (such as *circle*, *square*, *triangle*) in Pascal might include a tag (called *shape*) that identifies the particular variant referenced in a part of the program.

In certain types of data files, a key or an address that identifies a record and its storage location in another file. See *also* tag sort.

Tag Image File Format Abbreviated TIFF. A standard file format commonly used for scanning,

**Voltage regulator.**

This voltage regulator is style TO-220, one of several types available.

measure of the peak-to-peak voltage swing of an electrical signal. By its very nature, alternating current does not have a constant voltage, as does direct current. A signal that alternates between +10 and -10 volts would measure as 20 VAC.

volume Another name for a disk or tape that stores computer data. Each separate disk or tape is a volume, with a unique volume name or number. In some instances, a large hard disk can be divided into separate volumes, each of which is treated as a separate disk, even though all volumes reside physically in the same drive.

volume label Also called volume name. A name for a disk or tape, usually assigned by the user when the disk or tape is formatted (initialized). The name can consist of letters, numbers, certain symbols, or a combination of these. MS-DOS systems, which seldom use disk names except in directory listings, refer to the names as volume labels. Apple Macintosh systems, which often refer to disks by name, refer to volume names rather than volume labels. Volume labels enable a system to identify a particular disk, using a unique identifier.

volume name See volume label.

volume reference number See volume serial number.

volume serial number The optional identifying volume number of a disk or tape. MS-DOS (versions 4 and higher) assigns a volume serial num-

ber (displayed at the beginning of a directory listing) to each disk it formats. The Apple Macintosh operating system assigns a similar type of identifying label, called a volume reference number, which programs can use in referring to disks. The volume serial (or reference) number is not the same as a volume label in MS-DOS or a volume name on the Macintosh. *Compare* volume label.

von Neumann architecture An approach to computer design characteristic of most commonly used computers, including microcomputers, attributed to the work of Hungarian-born mathematician John von Neumann. The von Neumann architecture is synonymous with the concept of a stored program—one that can be permanently stored in a computer and, because of the way it is coded, can be manipulated or made self-modifying through machine-based instructions. The familiar concept of sequential processing, a one-instruction-at-a-time approach to operations, is characteristic of von Neumann architecture. Parallel architectures have evolved to bypass this sequential-instruction encumbrance, which has come to be known as the “von Neumann bottleneck.” See also parallel computer.

VRAM See video RAM.

VRC Acronym for vertical redundancy check. An error-checking method used to check the accuracy of transmitted data. VRC generates an extra bit (parity bit) for each character transmitted. The parity bit determines whether the character (byte) contains an odd (for odd parity) or an even (for even parity) number of 1 bits. If its value does not correspond with the type of parity being used, the character is assumed to be incorrect. *Compare* LRC; see also parity.

VT-52, VT-100, VT-200 Popular sets of control codes used in terminals originally manufactured by Digital Equipment Corporation. Appropriate software can enable a microcomputer to use these control codes to emulate such terminals in computer communications.